CHAPTER 3

Institutions

❄ CRITICAL FINDINGS

Institutional Incapacities Many Sierran ecosystem declines are due to institutional incapacities to capture and use resources from Sierran beneficiaries for investment that sustains the health and productivity of the ecosystems from which benefits derive.

Sources of Institutional Incapacities Institutional incapacities arise from four primary sources: (1) fragmented control of ecosystems among different jurisdictions, authorities, and ownerships, (2) absence of exchange mechanisms among these entities to sustain rates of investment and cooperative actions that reflect ecosystem values, (3) detachment between those who control ecosystems and communities that depend upon and care for them, and (4) inflexibility in response to rapid changes in population, economy, and public interests.

Regionalism The souces of institutional capacity and of potentials to improve upon capacity differ among the regions of the Sierra, which vary greatly in their institutional as well as ecological, demographic, and economic characteristics.

ASSESSMENT

The Sierra Nevada is embedded in a wide range of human interests extending throughout the region and beyond. Public and private institutions relating to natural resource use and environmental quality have evolved in part to serve those interests and in part to safeguard the Sierra Nevada itself. Institutions include governmental jurisdictions and public agencies as well as market and community structures. Timber, water, wildlife, and minerals—resources traditionally associated with the Sierra—are consumed by people outside the Sierra, principally in urban or agricultural areas of California. The amenity values of the Sierra drive a real estate market that increasingly draws on the wealth of exurbanite commuters or retirees. Recreational and spiritual values of the Sierra draw people from around the world. Although these values generate employment and income within the Sierra, a vast proportion of these benefits accrue to parties and interests outside the region. Several important social forces drive change in Sierran institutions, and problems emerge as they respond. Collaboration, market capitalization of the cost of ecosystem maintenance, activism, and legal rules contribute to the search for solutions to these problems.

Institutional Setting

The institutional context of the Sierra is a story of mechanisms that express social preferences. Institutional arrangements attempt to "close the loop," or tighten the connection between the ecological systems of the Sierra and the multiple stakeholders of the region. Institutions govern both the means by which benefits flow to beneficiaries and the manner by which these beneficiaries absorb the cost of, and reinvest in, the ecological systems that support them. Reinvestment, broadly defined, includes a range of initiatives whose aim is to ensure the continued integrity and function of Sierra Nevada ecosystems. Reinvestment may include mitigation of environmental impacts or rehabilitation of prior environmental degradation. Market institutions used elsewhere to close the loop between consumers and resources are generally underdeveloped or missing in the Sierra Nevada, leaving government institutions as the principal means by which preferences are expressed and reinvestment promoted.

Government entities, rather than market mechanisms, manifest preferences and direct reinvestment in the Sierra Nevada. Over the years, an institutional landscape has evolved that is diverse, complicated, and fragmented (figure 3.1). Institutions differ by purpose, authority, and jurisdiction. A large part of the Sierra Nevada is administered by federal agencies, and public agencies have responsibility for two-thirds of the land in the region (see chapter 1).

The institutional arrangements in the Lake Tahoe Basin, where there are more than seventy different federal, state, and local government entities, epitomize the complexity present in the larger region. Across the Sierra, each institution responds to, and implements, a different array of policies. The picture that emerges is one of byzantine complexity in which institutions involving every layer of government focus on a single component or process of Sierran ecosystems. In other sectors of the economy, markets perform that function; public institutions struggle together to articulate the definition of public and private good for the Sierra.

Timber harvest and replanting on private land and state land is regulated by the Forest Practice Rules promulgated by the State Board of Forestry and enforced by the California Department of Forestry and Fire Protection (CDF); various stewardship programs funded by CDF, the U.S. Forest Service's State and Private Forestry program, and the Natural Resource Conservation Service subsidize reinvestment. Congress, through laws and policy direction (e.g, National Forest Management Act, the National Environmental Policy Act, and other environmental laws), establishes the framework for the way national forests are managed. The Forest Service, guided by these laws and policy, determines timber

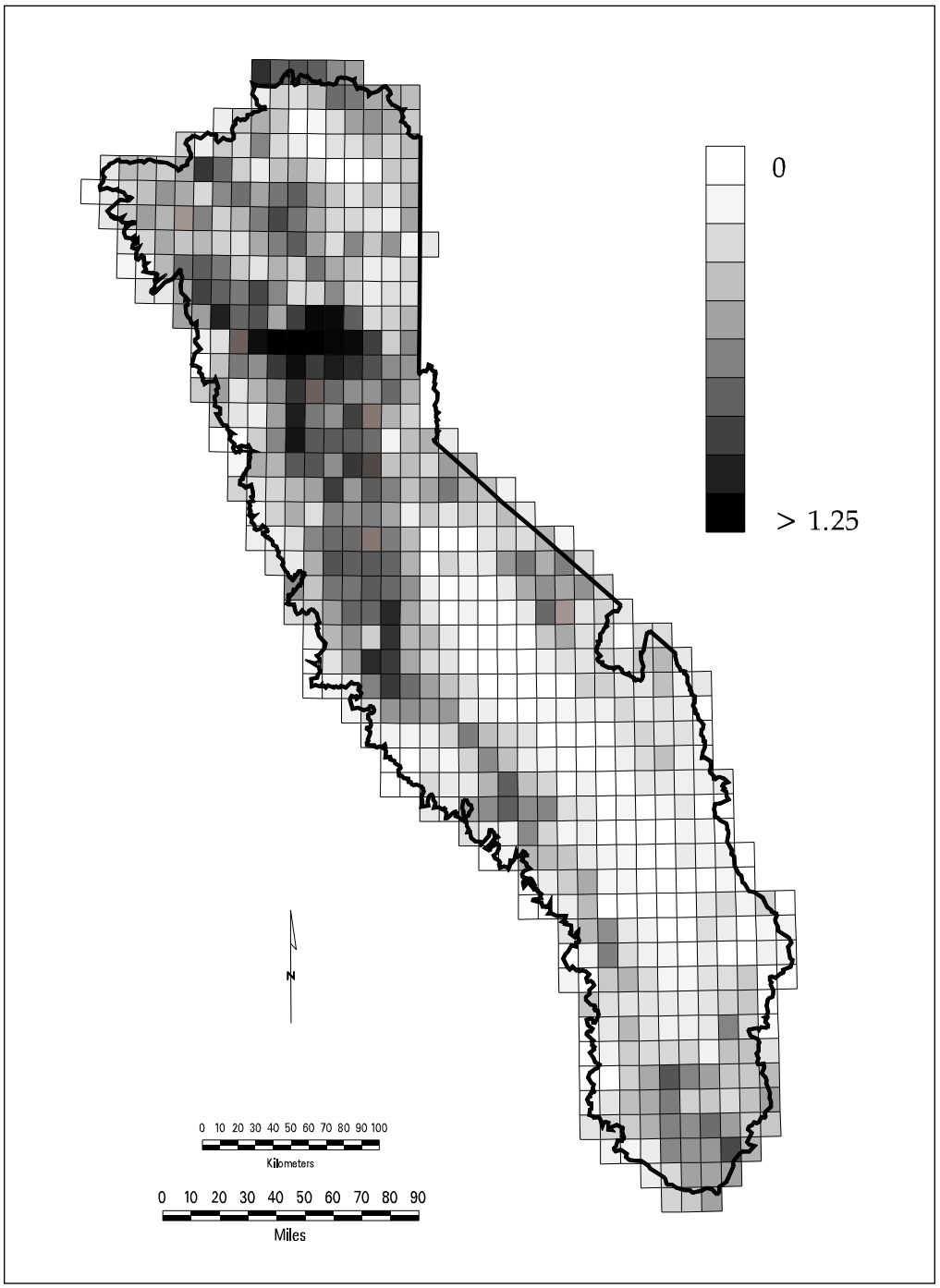

FIGURE 3.1

Public/private interface, relative densities of fragmentation. Units are kilometers of boundary between public and private land per square kilometer.

harvest levels but attainment of these levels is dependent upon congressional appropriations.

Development of private land is regulated directly through General Plans developed by county governments as well as through legislation at the state level, particularly the Subdivision Map Act and the California Environmental Quality Act (CEQA). Certain areas, such as the Lake Tahoe Basin, have even more complex arrangements involving adjoining states, local governments and authorities, and the federal government. The extension of the road network by county and state transportation agencies influences land development indirectly.

Wildlife and plant species are managed by the California Department of Fish and Game. Funds for reinvestment in wildlife, wildlife habitat, or native plants come from hunting and fishing permits, special government funds earmarked for game species (e.g., Hill Bill, AB 1580), and, on national forest lands, from timber harvest receipts (Knutson-Vandenberg [K-V] funds). When species or their habitats become sufficiently rare as a result of a number of factors, including pres-

sures related to human activity, they fall under the jurisdiction of the state and federal endangered species acts. At this threshold, a new web of regulatory authority is invoked to prevent harm to a species or its habitat. Depending on the habitat requirements of the specific species, government intervention may affect a wide range of activities in an attempt to preserve or restore certain ecosystem attributes.

Existing institutional arrangements related to water include the State Water Resources Control Board, which confers rights to water and is therefore required to articulate the public trust in in-stream flows. Additionally, the U.S. Bureau of Reclamation and the Army Corps of Engineers are responsible for administration of certain reservoirs, dams, and other facilities. The overall structure also includes water purveyors (local irrigation districts, municipal water districts, state and federal irrigation projects), which convey water to users. Users are frequently located in areas quite distant from the Sierra. Public and private utilities and federal regulatory agencies together effect water diversions, in some cases only temporary, in order to produce hydroelectric power. The quality of the water that flows through the vast natural and human plumbing of the Sierra is overseen by several regional water quality control boards and affected by a wide range of activities—road building, timber harvest, mining, grazing—each of which engages its own special web of authorities.

Public and private institutions express the priorities of human society. As social needs change, public expectations of these institutions also change. Accordingly, institutions respond by attempting to change their outlook, function, and methods. In the case of private markets, competitive pressures lead to voluntary changes in private behavior. In public institutions, where competition is generally absent, large-scale population shifts, new social demands, and grassroots activism are the most powerful forces of change. Institutions now dominant may find their positions eroding as other institutions wax powerful and new institutions arise.

Promoting ecosystem sustainability is not a priority common to all of the region's resource-related institutions. Sustainability and ecological health are viewed by many public and private institutions as compatible with their other institutional priorities, but to some degree, sustainability is a goal added on top of more established organizational functions. Consequently, these institutions rarely perceive the implications of their actions for the larger ecosystem or effectively review the cumulative effects of actions across a region. Undesired environmental impacts may not be addressed by either public or private institutions, leaving these problems, such as the mitigation of impacts or restoration of impaired environmental resources, to be solved in the future.

Drivers of Change

Several forces influence present and future ecosystem conditions in the Sierra Nevada.

Human Settlement and Development Scales and Patterns

Expanding urban, exurban, commercial, and recreational development directly and indirectly affect ecosystem status and health and cause institutional change. Population growth and development bring more people into the region, increasing not only the demand for services but also the diversity of values and issues influencing the management of the range.

Absence of Market Capitalization of Resource Use and Environmental Risk

Outside of markets in selected natural resources, such as timber, that emerge as commodities, markets for ecosystem resources have been relatively undeveloped and have drawn capital investment in the natural systems from which they arise. Several factors have contributed to this situation. First, many attributes of the ecosystem are simply not valued in a manner that motivates investment. Second, restrictions on exchange prevent value formation for aspects of the ecosystem that generate economic benefit. Third, localities lack the capacity to capture economic surpluses they generate and to then invest these surpluses for ecosystem health and social well-being. Fourth, the creation of markets for values and benefits that heretofore had been allocated by right or administrative arrangement—water is the preeminent example—upsets many existing arrangements and creates the need for different types of institutions.

Governmental Coordination

Current institutional arrangements provide a weak basis for ecosystem management. Jurisdictions and ownerships do not conform to ecosystems, and overlapping jurisdictions do not deliver public programs efficiently. Appropriations to some major federal agencies have supported production of timber and other commodities, while supplying substantially smaller amounts for administration of nonconsumptive uses. Interagency and intergovernmental cooperation may overcome these structural problems, which in many arenas led to gridlock. Although intergovernmental coordination blurs lines of authority and blunts institutional prerogatives, this trade-off may be necessary to pursue ecological approaches to management and to maximize the effectiveness of agency expenditures.

Grassroots Activism and Sustained Participation in Regional Environmental Affairs

Individuals with extensive knowledge about the Sierra Nevada who reside within the region and elsewhere are important sources of knowledge and energy. Grassroots and local activism creates new avenues of influence that compete with current institutions for legitimacy and authority. Local activism and involvement provide:

- Information and perceptions about the environmental conditions of the Sierra
- Monitoring of resource-related activities on public and private land
- Oversight of the conduct by public officials and agencies
- Influence on the direction of management

These driving forces interact in different ways throughout the Sierra region, so much so that subregions within the Sierra are readily apparent and may form the basis for institutional interventions.

Approaches Taken by Government Agencies

Public institutions and agencies involved in conservation and resource management have neither anticipated nor responded well to change. As a result, legislative bodies and outside groups have employed legal and legislative means to attempt to move agencies—with mixed success. Changing agency direction does not ensure, however, that ecosystem sustainability will be achieved. Many public agencies and institutions were organized to manage individual resources or geographical areas or to promote natural resource development. Effective as they are for many purposes, existing agency structures may not be entirely compatible with the concept of ecosystem sustainability or with ecological approaches to management.

Recent initiatives of the U.S. Forest Service and other federal and state agencies to address ecosystem concerns suggest that several aspects of ecosystem management, including the conservation of biodiversity and the control of cumulative environmental impacts, create particular institutional difficulties. These newer missions run afoul of the functional approaches to conservation and management utilized by agencies.

First, current institutional arrangements do not deal with environmental systems or parts of systems very well. Agency missions focus on particular areas defined by political geography rather than by landscapes or whole systems. Alternatively, they are empowered to administer particular attributes, with lesser authority to control what happens in the rest of the ecosystem in which they are embedded. For instance, a county General Plan regulates land use along a stream, the state water board regulates the final disposition of water within the stream, and a federal commission regulates the utility that determines the flow regime that carries water to its final user.

Second, agency planning methods differ enormously and consequently vary greatly in their ability to express the public interest. County land-use plans rely on county boards and commissions, as well as contracted outreach to discover the public interest, while federal land management agencies rely heavily on internal technical expertise, with Congress as integrator of public opinion. Given the divergence in mechanisms to discover the public interest in adjacent parcels of land that frequently differ not at all ecologically, it is not surprising that policies and project-level decisions seldom generate consensus.

Third, agencies and supporting arrangements do not capture surplus revenue or generate new capital. The role that lands play now in the Sierra Nevada often differs substantially from the role they played at the time the State Board of Forestry, U.S. Forest Service, and other critical institutions were created. As a result, the institutions may treat an area as if its principal role were the production of timber when in fact its major benefits are now watershed protection for power production and recreation. Without a means to tap all the benefits conveyed, agencies perpetuate a serious market imperfection and rely on budgets and other funding unrelated to ecosystem issues.

Fourth, as agencies fail to meet public expectations, the public questions their mission. This crisis of legitimacy and the loss of agency prerogatives render management even more difficult. Whereas in the private sector competitors would step in to meet the market's needs, the monopoly or oligarchy of resources agencies offers reform rather than substitution. And reform is frequently a slow and painful process, often requiring changes in law.

Fifth, government agencies continue to rely on relatively narrow technical expertise. Implementing effective ecosystem management, however, requires a broader range of expertise and information. Moreover, managing processes that elaborate the public interest requires management and political skills to complement technical expertise. Despite this need, county, state, and federal governments are only beginning to combine their expertise to address resource issues in a context that reflects the true political dimensions of the endeavor.

Finally, almost all public institutions simply avoid dealing with population growth and its effects on the resources, lands, and ecosystems for which they are responsible. Despite the profound influence that population growth, new human settlement, and development have had on ecosystems in the region, agencies lack authority or competence to respond effectively to these pressures.

If public agencies are to respond effectively to public wishes, scientific guidance, and legal imperatives for more ecologically sensitive approaches to resource management, then gaps in agency or institutional capacity must be addressed. The following examples illustrate how the problems just discussed impair the efforts of agencies to address current concerns.

Attacks on the U.S. Forest Service and Its Mission

Implementation of the National Forest Management Act (NFMA) of 1976 and other policies pertaining to natural resource management (e.g., Endangered Species Act) has been largely unsuccessful in overcoming polarization of opinion

on natural resource policy. NFMA mandated extensive planning and monitoring to promote conservation of forest resources and to resolve forest management controversies. Demand for increased public timber supplies, however, conflicted with other demands for increased recreation and wilderness preservation. Thus, in the absence of a clear mandate for management of the national forests that reduced conflict, controversy and conflict have grown. The more recent shift to ecosystem management attempts to deal with a constantly growing set of legal demands arising from controversy.

The requirements and standards in these resource management policies provided much of the force impelling state and federal managers and regulators toward sustainability. Without them, agency managers would lose much of their support for many activities critical to ensuring ecosystem sustainability. Yet the stringent legal requirements are insufficient by themselves to ensure that agencies will be able to implement sustainable management practices. Statutory mandates do not solve problems, nor do they necessarily imply a method to resolve problems in an equitable or efficient manner. Despite successive planning efforts that may ensure better ecosystem conservation, the ability of the Forest Service to implement a plan for land management that complies with current mandates and provides for conservation of biological diversity, fuels management, and a range of other forest functions is still subject to question by many scientists, by resource professionals, and by the public.

Agency Expertise

Resolution of many environmental matters facing decision makers, however, requires consideration of social, economic, and demographic trends that are frequently beyond the authority or the capability of the Forest Service and other resource institutions. Public policies and legal requirements impel the Forest Service and other federal and state agencies and other resource institutions to rely on technical expertise to resolve resource conflicts and respond to opposition to public programs. Over the past two decades, agencies have more effectively utilized a broader spectrum of ecological expertise and incorporated new kinds of scientific information in their planning, but they have neglected to use the planning process to develop political constituencies. Agencies therefore increasingly appear either unresponsive to contemporary demands to consider and retain ecological integrity as a part of all management actions or incapable of accomplishing traditional agency objectives while also ensuring ecosystem protection.

Funding for the Forest Service

Implementing an ecosystem management strategy requires funding sufficient to support budgetary requirements of new programs for land and resource management. Existing budgets of the U.S. Forest Service, the Bureau of Land Management, and other resource management agencies must themselves be placed in perspective as the product of a venerable and implicit congressional compromise. Historically, agency appropriations have been designed to support production of timber and other commodities; substantially smaller amounts were supplied for administration of nonconsumptive uses, forest-level research, and monitoring. This arrangement was designed to support multiple use of forest resources, including production of timber and other commodities, while respecting the role of the national forests in conserving natural landscapes and ecosystems. The diminishing emphasis on revenue-producing functions has led to lower overall revenue from resource activity on federal lands. Reductions in appropriations and funding from Forest Service timber programs have significantly reduced staffing levels of resource professionals within the Forest Service and other agencies. Strengthened commitments by federal natural resource agencies to improve scientific assessments of the condition of public lands and natural resources require added funds for research and monitoring and greater deployment of experts in the field. Activities associated with ecosystem restoration, including fuels management, require funding for activities that do not result in direct returns to the U.S. Treasury.

Increased funding sufficient to support these activities cannot be assured. As a result of shifting legislative priorities and deficit reduction, budget proposals supporting ecosystem management items are exceptionally vulnerable to attack and attrition during legislative debates. For this reason, approval for a fund supporting ecosystem management priorities such as monitoring, research, and adaptive management may be difficult to secure. Budget requests must compete against other deserving programs and projects.

County General Plans

County General Plans and associated environmental impact reports integrate information critical to the conservation of ecosystems and the management of natural resources. Studies within General Plans assessing the rate of conversion of undeveloped land to urban and suburban development are an important source of information about areas of potential future impacts. Similarly, open-space elements contained within plans have an enormous potential to foster conservation of important areas and resources. With respect to the future of undeveloped areas, General Plans frequently appear to be ratifiers of change rather than strategic plans for the conservation of biological diversity. In particular, General Plan projections for future buildout and the environmental impacts associated with buildout often fail to account for the effect of already approved subdivision of larger parcels and of shortfalls in infrastructure investment under current fiscal arrangements. The environmental impacts of future development are therefore likely to be significantly greater than estimated in the environmental impact report (EIR) of General Plans under CEQA. Moreover, mitigation measures to address identified impacts are often not developed due to so-called

overriding considerations. Many of today's most difficult and intractable environmental and fiscal problems associated with development reflect decisions made two to three decades ago, and today's policy choices will constrain future decision makers' options two to three decades hence. Existing coordination among open space, infrastructure, and land-use planning agencies seems very limited, and many policy actions by these agencies appear to be in direct conflict with one another.

Existing Market Mechanisms

Only a few of the resources generated in the Sierra—timber and land, in particular—pass through a market and are therefore controlled by institutional arrangements that may provide opportunities for reinvestment without government intervention. Even these resources, however, have complex webs of government authority regulating the market. For example, numerous authorities impinge on the land market in the Sierra. Reinvestment in this case means the mitigation of land development effects such that the range of values inherent in undeveloped land is at least maintained, if not enhanced. Such mitigation is governed almost entirely by nonmarket mechanisms involving compliance with the California Environmental Quality Act (CEQA) and the various development permit requirements of state and local government.

The market plays little or no role with respect to the other resources of the Sierra, including water. The value generated by the water that flows down the Sierra exceeds that of nearly all other resources, with the possible exception of recreation (including gambling). Reinvestment in the aquatic ecosystems of the Sierra is conspicuous in its absence. In only a few cases (the Feather River, Lake Tahoe, and to a lesser degree, the Mokelumne River) have the institutions involved generated reinvestment of time, energy, and resources in the maintenance or restoration of aquatic ecosystems. In other examples, reinvestment in wildlife, wildlife habitat, or native plants comes from hunting and fishing permits, from special government funds earmarked for game species, and, on national forest lands, from timber harvest receipts.

NEW FORCES FOR CHANGE

The traditional (progressive and technocratic) models for public administration have not responded adequately to the range of ecological, social, political, and economic aspects of resource management. The primary reason for this failure to respond seems to be the dominance of centralized policy and administration. Individuals and public and private interests are frustrated by these failures and have developed pragmatic solutions to centralized institutional failures. Observation of incipient efforts indicates a move away from centralized administration of policy and its implementation, with a cautious nod to local and regional collaborative strategies. The following section briefly discusses several examples, illustrating both the promise of these approaches and the problems facing resource management and conservation agencies.

Attempts at Interagency Collaboration

Fire Protection

Interagency collaboration for fire fighting in California and other western states has grown steadily since the early 1970s, when severe fires in southern California led the California Department of Forestry and Fire Protection (CDF), the U.S. Forest Service, and other fire control agencies to discuss formal cooperation. The aim was to more effectively marshal forces to fight severe wildfires, thereby reducing losses to private property owners and to the public. Project Firescope brought together agencies with fire protection responsibilities in southern California and included fire research, development, and application funded by the Forest Service. It required collaboration among cities, counties, the state, and federal agencies.

The project vastly improved the coordinated response of multiple agencies to wildfires. Several mutual aid agreements were concluded to further the idea of interagency cooperation. Agencies now automatically respond to wildfires as parts of a larger integrated force. Exchange of personnel and equipment from one agency to another, for example, is standard procedure, as is reimbursement from one agency to another for service and assistance rendered. As a result, there is now a relatively well coordinated multiagency fire protection system to control severe wildfires. This model has spread worldwide as an effective way to integrate emergency response.

The agencies could undertake cooperation of this kind for implementation of ecologically sensitive resource management as well, but they have not. Interagency initiatives to promote fuels management, for example, have been extremely limited. Where cooperation has occurred, it has tended to focus on assistance to private landowners. Scant federal-state collaboration has occurred regarding either federal or state land. Interagency fire protection appears to be a special case. As a result of a nearly universal perception that fighting fire had paramount importance, institutions were able to make enormous innovations quickly and to collobarate successfully. The example set by fire-fighting agencies demonstrates, however, that a cooperative approach can be successful.

Protecting Forest Values on Private Lands

Driven largely by interagency controversy, California state agencies have developed a reasonably effective approach for ensuring sustained management of privately held forests. Although the authority to regulate various environmental goods produced on forest lands is distributed among several state and federal agencies, these agencies have attempted over the years to coordinate their enforcement programs through

the state's administration of the California Forest Practices Program.

Forest practices on private and state lands in the Sierra and throughout California are administered under the California Forest Practices Act of 1973. Under this law, the California State Board of Forestry adopted rules and regulations that implement the intent of the act and other state and federal laws. To gain the approval of the California Department of Forestry and Fire Protection (CDF), landowners are required to submit a timber harvesting plan specifying the harvesting and reforestation activities they expect to pursue. Provisions to protect soil and land productivity, water quality, wildlife habitat, endangered species, historical and archaeological sites, and aesthetics are included in the harvesting plan.

The timber harvest planning review process was originally deemed to be independent of the California Environmental Quality Act. However as a result of a 1970s lawsuit, the review process was brought under the state's far-reaching environmental quality program. Subsequent executive, legislative, and administrative action made the review process a "certified program." As such, the fundamental principles and requirements of state environmental law are administered through the CDF-led program. Foremost are the requirements that the potential environmental impacts of timber management be disclosed and that all feasible mitigations be applied to reduce or avoid significant adverse effects. Where adverse effects cannot be avoided, a statement of overriding concerns must be provided.

When critical wildlife, plant, or habitat resources are thought to occur on a timber management site, consultation is required between the individual or entity submitting the plans and the California Department of Fish and Game (CDFG). In the case of federally listed species, the U.S. Fish and Wildlife Service also can become involved in plan review. Required consultation consists of a review by a CDFG biologist of species locations and potential project hazards. The biologist can consult with species experts and the project proponent to develop project mitigations and alternatives. The CDFG must then issue findings and permits as necessary to protect a species or habitat area. No project can be approved that would jeopardize a species.

Water quality protection also is handled through the timber planning review process. Negotiations between the Board of Forestry and the State Water Resources Control Board began in 1977 to identify nonpoint pollution sources related to silviculture on private forest lands and to determine whether the Board of Forestry's forest practice rules met the standards of protection required under federal and state water quality laws. After years of negotiation, the Board rules are provisionally certified as being in compliance with the federal Clean Water Act.

Environmental and landowner groups, and the general public, regularly express concern about the effectiveness of the private forest regulatory program. In a review of the application of best management practices, adequacy of protection could not be fully evaluated because practices were not applied in many cases. Nevertheless, the state has managed to construct a coordinated approach for addressing sustainable management of its private forests in a way that helps to minimize administrative and compliance costs and to reinforce the view that forest lands produce important environmental and social values beyond timber.

Other Examples

Concern over the viability of the California spotted owl led to an unprecedented cooperative effort involving state and federal agencies in research aimed at the development of a strategy to protect the owl and its habitat. Cooperation collapsed, however, when the U.S. Forest Service, in response to legal mandates, independently implemented new policy for national forest lands. This incident demonstrates both the opportunities and the limitations inherent in interagency cooperation as it exists under current legal and administrative arrangements.

Seeking to facilitate intergovernmental multiagency planning and cooperative management to conserve biological diversity, the state of California, federal agencies, and others signed California's Memorandum of Understanding on Biological Diversity. Led by the state Resources Agency, the federal Bureau of Land Management, and the U.S. Forest Service, an array of local, state, and federal organizations and agencies has agreed to cooperate to ensure better conservation of the state's various biological resources and habitats. Many citizens, resource professionals, local groups, and others involved in natural resource issues contend that existing agency structures are incapable of or, at best, inefficient in promoting and implementing ecologically sound resource management agendas. The agreement sought to rectify this deficiency by overcoming stumbling blocks of jurisdictional differences and bureaucratic inertia. The California Biodiversity Council, formed as a result of the agreement, is facilitating the sharing of information among public organizations and other partners to develop more effective approaches to conservation.

Agencies, through actions like those just described, are beginning to deal with complete environmental systems. Recent management efforts on the national forests and in other parts of the Sierra attempt to incorporate deeper understanding of the role played by ecological disturbance in maintaining and sustaining the Sierra landscape. Within agencies, at least, managers are drawing on broader sets of scientific and technical expertise. Agencies also recognize that cooperation with one another is essential, although legal mandates make it difficult for agencies to truly share responsibility and management authority.

Market Solutions and Capital Reinvestment

Insufficient funding limits many conservation objectives, even though the Sierra generates great wealth. Another perspec-

tive suggests that there is insufficient agency capacity to capture the economic value that does exist for purposes of promoting reinvestment in Sierra Nevada ecosystems and their resources. The absence of mechanisms to tap economic values for reinvestment causes underinvestment and even disinvestment in ecosystems, and it distorts the priorities of the investments that do occur. The search for other methods to finance environmental improvements has led to an effort to recover from the beneficiaries the costs of maintaining the benefits provided by the environment.

Reinvestment in the resources and ecosystems of the Sierra Nevada depends on the creation or modification of the institutional framework. Institutions in certain subregions are already being altered to permit and encourage greater reinvestment in environmental resources. In the Lake Tahoe Basin, for example, the loop between overall environmental quality and those who benefit is nearly closed. Public and private priorities have channeled hundreds of millions of dollars and years of human effort into reinvestment in the restoration of the basin's environment. In the Feather River basin a Coordinated Resource Management program joins together a water supply to the State Water Project, an abundant forest and timber resource, relatively slow population growth, and resource-dependent communities. Closing the loop in that environment implies institutional arrangements quite different from those in the Sierra foothills around Sacramento, where a very different mixture—amenity values, fire control, high population growth, and economic diversification—define the environment.

Reinvestment in these systems faces several obstacles. The first of these is the simple inability to value certain resources or ecosystem attributes. It is difficult, for example, to obtain agreement on the value of an intact ecosystem in the Sierra Nevada. A second difficulty arises due to restrictions on exchange and markets, even where it is possible to place a value on resource attributes. An illustration may be seen in the opposition to suggestions that campground and other recreational fees be increased to better reflect the cost of providing those services. A third obstacle is the absence of effective cooperative responses to environmental and resource-related problems. Even where the diagnosis of environmental impacts is clear and methods to address environmental impacts are known, legal, institutional, and financial barriers may thwart the implementation of effective coordinated responses. A final, related problem is the inability to ensure that capture of the value accruing from a variety of natural resources and ecosystems will lead to reinvestment in the areas where these ecosystems and resources are located. The surplus value in resources such as water and hydroelectric power chiefly accrue to downstream users who are out of the area of origin. Mechanisms for reinvestment in the watersheds that support these areas are emerging, but their full potential has yet to be explored.

Local Community Involvement

Citizens and local interests in the Sierra Nevada have a central role to play in the formation, adaptation, and implementation of natural resource conservation measures. Resource agencies, no matter how professional, are not equipped to address local ecological and socioeconomic concerns, even where a landscape is wholly under the jurisdiction of one agency. In light of the local variability in landscapes and economies, designing an approach to implementing environmental policies can benefit from the input of those with local knowledge. Local and regional "place-based groups" and others are organizing in the Sierra to address these issues at the regional and subregional levels. Perhaps as never before, landholders, agencies, and other players are coming together to plan the implementation of environmental policy and to discuss its implications at the local level.

Local and regional groups, both those with established roles and unofficial groups, have rapidly proliferated, and recently they have begun to figure prominently in discussions about resource policy. Some of the better known and more diverse examples include the Applegate Partnership in Oregon, the Klamath Bioregional Group, and in the Sierra, the Feather River CRM and the Quincy Library Group. The impetus for the formation of many watershed or ecosystem planning efforts has been the failure of more traditional agency planning or regulation to achieve intended goals. Consequently, agency personnel often regard these groups as adversaries or competitors of public agencies, but a local place-based approach can speed implementation of ecosystem policies by addressing whole environmental and regional economic issues and by suggesting imaginative methods to reallocate existing capital to pragmatic solutions. Observation of incipient watershed and ecosystem planning groups in California and elsewhere suggests that industrial concerns and other commodity interests, environmental groups, and rural communities all participate in these efforts.

Local groups, although often able to draw on considerable talent and expertise, will not displace agencies, nor will they succeed in developing workable resource management or conservation programs in every case. Several factors bear on the enormous potential in this approach for innovative program development and problem solving. First, because they do not possess the formality of public agencies, these groups bring fresh approaches to contemporary problems. Generally, however, a local group cannot replace the depth of knowledge, expertise, and research capabilities of public agencies. Additionally, local groups may not entirely reflect local perspectives, nor does the creation of a place-based group ensure protection of the nation's broader interest in public lands and ecosystem integrity. Increasingly, however, this type of community involvement appears as a complement to centralized agency planning and to project-level decision making.

Law as a Force for Bargaining and Innovation

Existing legal arrangements contribute significantly to progress toward sustainability. Although the SNEP assessment illuminates certain difficulties with existing laws and public programs and their administration, the existence of large legal "hammers" imposed by state or federal authorities, designed to ensure representation for the interests of nonlocal parties, compels some parties to come to the table. These laws also specify the power and authority of all public and private / individual and corporate players in any collaborative relationship. Nevertheless, these two elements—the relationship of agency mandates to resource or environmental issues, and the relationship of the agency to the public—largely determine the context for policy implementation and establish the structure for environmental planning and management. The SNEP assessment has not systematically addressed the functional relationship between those variables and the success of "collaborative planning"; thus it is premature to make strong claims about what kind of local or regional coordination will work. Surely there is no value in emphasizing a particular new institutional form just because it is different from the poorly functioning system we currently have in place. There is no assurance that the alternative will be any better.

STRATEGIES

Sierran institutions do not yet invest the money and effort that are needed to sustain the health and productivity of the ecosystem against the tremendous withdrawals of the benefits it affords. It is increasingly important to attain institutions that overcome pervasive tendencies to separate the beneficiaries, owners, and stewards of ecosystems; to fragment ecosystems among often-competitive authorities and interests; and to resist adaptation to intensified pressures on ecosystem capacities.

Goals

The SNEP assessment suggests five goals for institutional reform to sustain and restore the ecosystems of the Sierra Nevada. Develop institutions that:

1. Return resources from beneficiaries of the Sierra to those who will improve the ecosystem qualities from which benefits flow.
2. Strengthen cooperation among federal, state, and local governments and agencies whose authorities and resources converge, overlap, or interact in the ecosystem, and strengthen cooperation between the public and private sectors.
3. Increase community involvement in the protection and management of Sierran ecosystems.
4. Provide legal, regulatory, and financial support to advance such reforms beyond current levels of ad hoc spontaneity.
5. Take advantage of characteristic aspects of Sierra Nevada regions to leverage progress on issues of regional and rangewide scale.

Examples in the Sierra suggest how these goals can be achieved for some problems and how these examples of success might be extended to other problems. They also show how different regional conditions within the Sierra may affect the appropriate combinations of strategic possibilities in different places.

Potential Solutions

Goal 1. Investing Shares of Ecosystem Benefits in Sustained Ecosystem Health and Productivity

Institutionalized strategies of timber-based reinvestment such as yield taxes or "K-V" funds have not been extended to other values the Sierra provides in abundance.

Despite the vast financial basis of the migration of settlers and recreationists to the Sierra, there are virtually no institutions through which the values thus generated can be captured and invested in sustaining the very qualities that attract people to settle, stay, and play. Possibilities for changing these situations include fair-market recreation fees, and subdivision and land transfer taxes, that flow into funds and banks designed specifically for ecosystem reinvestments. Other examples of strategies are described in chapter 8—requiring that water users outside the Sierra pay taxes to support management in source areas—and in chapter 4—recovering funds during fuel reduction treatments.

Goal 2. Developing Multijurisdictional Coordination

Over five decades, the federal, state, and local governments of California have developed a remarkable system of coordination for fire protection throughout the Sierra and elsewhere in the state. Such coordination seems necessary, appropriate, and attainable for other aspects of the Sierra ecosystem. For example, riparian systems and aquatic regimes cross federal, state, and local jurisdictions throughout the Sierra, to the extent that no one jurisdiction alone can undertake the actions necessary to sustain or restore the quality of these deteriorated systems. Multijurisdictional coordination, such as cooperative riparian zones or watershed agreements and councils, is essential if maintenance and restoration of the Sierra's depleted riparian and aquatic systems are to be achieved. These are described more in chapter 8. The Tahoe case demonstrates what is possible when circumstances are particularly ready and able to support the necessary cooperation.

Other candidates for multijurisdictional coordination include wildlife habitat regimes and timbersheds. Species complexes are difficult to preserve, for example, if efforts to do so occur on but one side of a jurisdictional fence crossing a habitat system. Sierra timber stocking and age structures are also difficult to sustain when shifts in relative federal or state harvest restrictiveness transfer price pressures for harvest between private and public lands. California's Biodiversity Council has made an important initial stride toward the kinds of complementary endeavors that are needed.

Goal 3. Involving Communities in Ecosystem Stewardship

In recent years, community efforts in the northern and southern Sierra have demonstrated the great knowledge, capacity, and care that residents are prepared to bring to the large problems of ecosystem management. Whether or not the specifics can be generalized, the basic lesson has general value: residents of the Sierra will bring unique resources to the enhancement of ecosystem health and productivity if allowed the opportunity to do so. Resident communities can serve broad public purposes if recognized as having special interests and capacities. The lesson seems to have particular possibilities in problems of riparian restoration and watershed, habitat protection, and recreation development. Community task forces that have been successful in initiating local restoration, monitoring projects, and doing environmental education may serve as models for communities elsewhere.

Goal 4. Making Legal, Regulatory, and Financial Reforms

The small number of specific examples of success indicate the institutional resistance to more general applications of their principles. Specialized and spontaneous endeavors take immense energy and commitment within a framework of institutions that does not facilitate them. Legal, regulatory, and financial reforms will be necessary if the fundamental problems of underinvestment in ecosystem viability, weak coordination among jurisdictions, and isolation of resident communities from ecosystem management are to be overcome on more than an ad hoc basis.

Goal 5. Developing Regional Strategies

Although the solutions mentioned apply Sierra-wide, priority combinations are likely to vary by region because of diverse circumstances. The assessments demonstrated the importance of, for example, differences among regions in population density, ecosystem potential, economic base, wealth and its distribution, and jurisdictional mixes as well as physical and ecological aspects. Such factors create differences that affect regions' particular needs and capacities to encourage reinvestment, coordination, and community involvement. The following sections are illustrative.

Feather River Basin: Develop Cooperative Water and Timber Regimes. The economy of the lightly populated Feather River basin depends upon the export of timber and water. Institutional possibilities in this region seem to be of two primary kinds. One would focus on transferring shares of downstream water benefits to upstream watershed maintenance. It might require a mechanism that brings the State Water Project and its water contractors, Pacific Gas and Electric Company and its customers, the timber industry, and the U.S. Forest Service into an arrangement whose aim is to ensure finance and cooperation to sustain the timber-and-water system of resource management and the natural functions that underpin this system.

The second possibility would focus on integrating local communities in multijurisdictional management of the region's timberlands. The Quincy Library Group has demonstrated the value of local voices, talents, and resources in guiding national forest management. Broader possibilities arise when attention turns to the problem of sustaining the regional timber economy as a whole. Contemporary versions of "cooperative sustained yield units," for example, "cooperative ecosystem management units," may offer a useful direction, with the state playing a more central role than in the earlier versions of such public-private-local partnerships.

Tahoe Basin: Diversify Purposes of Jurisdictional Integration. In the Tahoe Basin to the south and east, the relationship between the stakeholders and the land is explicit. There is no place in the Sierra where beneficiaries pay a greater share of the upkeep, enhancement, and restoration of the natural system. Jurisdictions, finances, policies, and programs have been integrated through a number of public agencies, including the University of California, the Tahoe Regional Planning Agency (TRPA), the state Water Resources Control Board, the U.S. Forest Service, the California Tahoe Conservancy, the Nevada State Lands Division, and, significantly, local government. The presence and clarity of Lake Tahoe, the access provided by two major highways, and the historic pattern of public and private land have fostered a developed recreational economy, with regional and national stakeholders who recognize the importance of environmental quality to business in the basin. The unique definition of the mission, the depth of institutional capability, and the wealth of the stakeholders have goaded institutional innovation across many levels of government, leading to considerable investment in ecological restoration and, increasingly, in management of surrounding wildland ecosystems. There is real potential in exploring the Tahoe case to identify possibilities that may work in situations that are less well endowed or that, like the Highway 80 and 50 corridors, are evolving into conditions such as prevailed in Tahoe when the TRPA first was conceived.

Gold Country: Strengthen Local Governments. To the north and east of Sacramento, the Gold Country region and its communities have been dramatically transformed from a resource-

❄ *The Feather River Coordinated Resource Management (CRM) Group*

Fierce polarization around natural resource use and management, a growing recognition that continued battles would only further local anguish and lead to continued loss of local control, and recognition of the need to develop local economic opportunities through local watershed restoration projects all led to the development of the Feather River Coordinated Resource Management (CRM) Group. Begun in 1985, the Feather River CRM Group, which encourages local initiative and participation in resource management on public and private land in the headwaters of the State Water Project, is the longest running CRM group and one of the most successful in the state of California.

The birth of the Feather River CRM took place in 1985 when, following local initiative, twelve federal, state, regional, and local entities signed a Memorandum of Understanding (MOU) with the objectives of optimizing beneficial uses of water; emphasizing education and prevention over regulation; and resolving participants' concerns through proactive involvement in a consensus-based planning process. After several erosion control project successes, the groups cooperating under the MOU decided to become an official Coordinated Resource Management Planning (CRMP) Group. As Mike Kossow, one of original organizers of the group, stated, "We were a CRMP but just didn't know it yet." The decision to become a CRMP group was in part to foster better coordination among resource management agencies and in part to gain increased access to federal programs and grants for work on public and private land. Although CRMP formation led to a new institutional structure for the group, members did not hesitate to modify this structure to meet their specific needs and values. The commitment of the group to maintaining a results-focused process and an emphasis on projects and not just planning, led the group to drop the *P* (for planning) in the CRMP name and call itself the Feather River CRM. The remediation of

Restoration in Hoskins Creek, Plumas County. (Photo courtesy of Plumas Corporation.)

cumulative watershed damage remained a primary objective of the group.

The Feather River CRM has achieved considerable success by developing a process that reflects the particular ecological, institutional, and social contexts of the CRM area and links a range of ecological, institutional, and social goals. The coordinator of the CRM, Leah Wills, is personally and professionally committed to a vision of economic and ecological sustainability, a vision that has been embraced by most if not all CRM members. This joining together around common goals has reduced tensions and increased cooperation both between public agencies and landowners and between agencies themselves. The process has also stimulated personnel at different agencies to undertake cooperative projects. One observer of the Feather River CRM noted that the group represents an important evolutionary phase of bringing communities together around sustainable development, and in a way that is not theoretical but concrete and grounded. In roughly ten years of operation, the Feather River CRM has initiated thirty-eight watershed restoration projects on 4,100 acres, rehabilitated 14.5 stream miles, and contributed $4 million dollars to the local economy, mostly through creation of local jobs.

The ability of a wide range of individuals representing varied (and often historically conflicting) institutions to come together around a common goal has been deemed the most important success of the CRM. A fundamental quality of the Feather River CRM process has been that members have been able to subjugate their individual differences to the larger mutual goal of a healthy community in a healthy watershed. By demonstrating the real benefits of cooperation, the CRM has created a local atmosphere of increased trust that catalyzes additional community-building activities and allows other consensus-based groups, such as the Quincy Library Group, to grow and flourish.

dependent to a development-driven economy by the enormous influx of new residents. The qualities of the landscape now form a principal component of property values and social motivation. Local activism mobilizes intense energies around issues of private land development (county oak ordinances, General Plans), public land use (timber versus recreation versus wildlife habitat), and the management of the rivers (flood control versus power production, and water supply versus recreation). Fire is a growing concern, both as a threat and as a scarce or distorted ecological process. Councils of government and economic diversification are rapidly supplanting Coordinated Resource Management Plans (CRMPs) among landowners, which continue to be important in the Feather and other water-focused regions, as the principal means by which governments interact with economic activity and other private behavior.

Closing the loop between residents and beneficiaries in this region means building tighter connections, at many scales and between many groups and jurisdictions, in a context where traditional community identities are diminishing and common visions of the land and its future are eroding. This seems most likely to occur through a strategy of strengthening local governments and their relations with private capital.

Mother Lode: Strengthen Local-State-Federal Cooperation. South of the Gold Country, the Mother Lode displays demographic and economic characteristics akin to those of the "new gold rush" counties in 1970. Particular areas retain their industrial, timber, or water emphasis, for example, the Mokelumne and Tuolumne river basins and ranching and mining in the foothills. Continuing urbanization along the Highway 99 corridor will create metropolitan areas similar to Sacramento and Fresno, and highway improvements will translate urban growth in the valley into suburban or exurban development in the foothills. Consequently, while closing the loop in this region will certainly involve local governments, with their control over land use, it must also involve state agencies, with control over water and private forest land, and federal agencies, with control over public land and irrigation development. Perhaps most critical among these governmental partners are state and local agencies that control development in the adjacent valleys and those that review and approve transportation improvements for the region.

San Joaquin: Modify and Tax External Influences to Protect and Restore. Farther south, another part of the western slope of the Sierra extends from Madera County south to the Tehachapis. These counties, unlike counties farther north, have economic and political centers located in the agriculture of the San Joaquin valley and in agencies and representatives in Washington, D.C. This region contains three national parks, many wilderness areas, and other recreational sites. On the basis of land allocation alone, recreational use of the land appears paramount. Budget and management decisions are subject to congressional discretion. The important flows are imports into the Sierra from the Central Valley: that is, recreation-seekers and air pollution. Ozone and other pollutants generated by activities in the Central Valley threaten forest integrity and lessen the recreational value of the region. Closing the loop in this region means changes in the movements and activities of people so as to reduce or respond effectively to undesired ecological impacts in the southern Sierra.

East Side: Create Development Nodes and Capture Their Value for Ecosystem Investments. Finally, the eastern side of the Sierra Nevada is in transition to being primarily an amenity-

❄ *Coalition for Unified Recreation in the Eastern Sierra (CURES)*

Created in 1992, the Coalition for Unified Recreation in the Eastern Sierra is an informal partnership of recreation providers, chambers of commerce, local businesses, the environmental community, and federal, state, and local governments. As its mission, "CURES is dedicated to preserving the Eastern Sierra's natural, cultural, and economic resources and enriching the experiences of visitors and residents."

Members of CURES spent one year working on a description of a collective vision for the future state of recreation in the eastern Sierra, taking into consideration divergent viewpoints involved in the coalition. The vision statement is used as a tool for prioritizing and strategizing the projects that CURES undertakes.

Since defining a future vision, CURES task groups have developed the following projects:

- Annual compilation of interpretive activities and special events and activities available for visitors at all the visitor contact points in the eastern Sierra.
- Production of a regional recreation opportunities map / brochure that is translated into Spanish, French, and German.
- Tourism enhancement projects such as "Good Host" seminars for business owners, a computer link to the Yosemite Area Transportation Information system, and market research.
- Development of a 200-mile scenic byway on Highway 395, considered one of the crown jewels of California. The byway will feature twenty-eight interpretive stops and visitor information kiosks. Information will be provided on recreation opportunities and the services that are provided in twelve different communities. The geologic, ecological, and cultural resources of the area—including Mono Lake, Bodie State Historic Park, the Ancient Bristlecone Pine Forest, and Mount Whitney—will be interpreted.

Through their collaborative efforts, CURES members are leveraging dollars, avoiding duplication of effort, and providing high-quality recreation to visitors and residents of the area. In line with achieving their vision, their efforts are working toward a regionally sustainable economy that is linked to the sustainability of the natural environment of the eastern Sierra.

Nancy Upham, Public Affairs, U.S. Forest Service, Bishop
Andrea Lawrence, Supervisor, Mono County, Mammoth Lakes
Ralph McMullen, Director, Mammoth Lakes Visitors Bureau

dependent economy. While export of water and power has long been a key activity, both dispersed and developed recreation are major industries. The region, containing both wilderness areas and Mammoth and June Mountain ski resorts, straddles the setting of the dispersed recreation of the southwestern slope of the Sierra and that of the developed recreation of the Tahoe Basin. Investment in transportation and urban cultural amenities may determine both the development trajectory of the region and the nature of the institutional mechanisms that arise to bind the southern California recreational users to the management of the region's predominantly public land. In contrast, the loop between urban water users, not just in Los Angeles but also in western Nevada, and riparian and lake-based beneficial uses within the region has been established over time as a result of legal action and judicial decisions. There may well be no surplus or slack left in water supply in this area. Unless the loop can be expanded to include alternative suppliers of water, legal action may remain the primary recourse for balancing water supply and obligations to protect the public trust. In the recreation-based eastern Sierra, recreation user fees may become an especially effective way to close the loop.

Implications

Institutional reforms need to draw their direction from local circumstances and the perceptions of external threats and opportunities. Thus, different places contain different possible responses to the disparities they face between the ecosystem benefits they provide and the shares of benefits they receive to sustain them. Our regional illustrations are intended more to provoke innovation than to prescribe particular approaches.

But it is also true that innovations can be easy or hard, successful or not, depending upon whether the institutional context in which they are tried is sympathetic or resistant. Various of these contextual issues are Sierra-wide: institutional conditions that make quite difficult the formation of links between benefits and ecosystem sources; among different governmental jurisdictions, agencies, and private sector groups; and between those who control Sierran ecosystems and those who live in them. The regional illustrations indicate the diversity of institutional opportunities. The Sierra-wide picture argues as well for sharp attention to the general difficulties confronting investment, cooperation, and community involvement for the sustainability and restoration of Sierran ecosystems.